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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/755,389	01/05/2001	Sanjeev Banerjia	10990960-1	5215

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EXAMINER

FOWLKES, ANDRE R

ART UNIT	PAPER NUMBER
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2192

DATE MAILED: 06/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.



Office Action Summary

Application No.

09/755,389

Applicant(s)

BANERJIA ET AL.

Examiner

Andre R. Fowlkes

Art Unit

2192

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_



### **DETAILED ACTION**

1. This action is in response to the Appeal Brief filed 4/18/2005.
2. In view of the appeal brief filed on 4/18/2005, prosecution is hereby reopened.

New grounds of rejection are introduced below. To avoid abandonment of the application, appellant must exercise one of the following two options:

- (1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or, (2) request reinstatement of the appeal. If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

The previous office action has been withdrawn. Claims 1-23 are pending in the application.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, 12-20, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chilimbi et al. (Chilimbi), U.S. Patent No. 6,330,556 in view of Neufeld, U.S. Patent No. 5,974,438 (art made of record).



As per claim 1, Chilimbi discloses a system to optimize cache utilization using hot/cold fields to partition data by a compiler (Fig. 9 step 825 and at col. 12:20-50), which covers the steps of:

- **storing a plurality of data in a cold partition in a memory** (col. 2 lines 39-43, “the most heavily referenced (data) ... are kept in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold (memory location)”)),

- **determining whether the datum that has been stored in the cold partition is hot** (col. 2 lines 39-43, “the most heavily referenced (data) ... are kept in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold (memory location)”)),

- **moving the data to a hot partition in the memory when the datum has been determined to be hot** (col. 2 lines 37-43, “The partitioning is based on profile information about (data) ... access counts ... the most heavily referenced (data are placed) ... in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold (memory location)”)).

Chilimbi does not explicitly disclose caching **instructions**. However, Neufeld, in an analogous environment, discloses caching data and **instructions** (col. 12: 66-13:5, “The processor utilizes the cache memory lines to rapidly access data and instruction information for the execution of the process thread”).

Therefore, it would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to incorporate the teachings of Neufeld into the



Art Unit: 2192

system of Chilimbi to have a code/instruction cache. The modification would have been obvious because one of ordinary skill in the art would have wanted to efficiently access code and/or data by using well known and well documented data/instruction caching techniques.

As per claim 2, the rejection of claim 1 is incorporated and further, Chilimbi discloses that **the step of determining whether the datum is hot comprises: maintaining a different associated counter for each of a plurality of datum in the cold partition of the memory; incrementing or decrementing the count in the associated counter each time its associated data is executed; and concluding the determination that a data is hot if the count in the associated counter reaches a first threshold value** (col. 2 lines 37-43, "The partitioning is based on profile information about (data) ... access counts ... the most heavily (executed data) ... are kept in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold (memory location)").

As per claim 3, the rejection of claim 1 is incorporated and further, Chilimbi discloses that **the hot partition is contiguous and disjoint from said cold partition in said memory** (col. 3 lines 65-67, "division of (data) into two (groups) comprising hot access fields and cold access fields", and Fig. 1, item 22, and the associated text (e.g. col. 4 line 5 – col. 5 line 67), describes the computer memory used in this system, which is capable of containing contiguous and disjoint memory sections).



As per claim 4, the rejection of claim 2, is incorporated and further, Chilimbi discloses **maintaining an associated counter step comprises maintaining counters in a data structure external to cache memory** (col. 2 lines 37-39, "The partitioning is based on profile information about (data) ... access counts", and Fig. 1, item 20, and the associated text (e.g. col. 4 line 5 – col. 5 line 67), describes a conventional computer system, which is capable of maintaining counters external to cache memory).

As per claim 5, the rejection of claim 4 is incorporated and further, Chilimbi discloses **the step of at least temporarily delinking blocks of translations stored in said cold partition so that control exits the cache memory in order to perform the incrementing or decrementing step** (col. 2 lines 35-36, "Data structures (blocks) are partitioned (delinked and accounted for) into heavily referenced and less heavily references partitions").

As per claim 6, the rejection of claim 2 is incorporated and further, Chilimbi discloses that **maintaining within said memory an associated counter step comprises maintaining one of said associated counters for each entry point into a plurality of the data in said cold partition of the memory** (col. 2 lines 37-39, "The partitioning is based on profile information (maintained in the memory) about (data) ... access counts").



Art Unit: 2192

As per claim 7, the rejection of claim 2 is incorporated and further, Chilimbi discloses **maintaining an associated counter step comprises logically embedding update code on an arc between two** data items (col. 6 lines 58-63, "Each of the data elements defined in FIG. 2 are shown as nodes (i.e. individual data items) in FIG. 3 with arcs or edges drawn between them. The nodes are representative of all instances of the data structure. The edges are weighted to indicate field affinity (i.e. an associated counter)").

As per claim 8, the rejection of claim 2 is incorporated and further, Chilimbi discloses **maintaining an associated counter step comprises maintaining one of said associated counters for each** item in the hot and cold memory locations in an **associated microprocessor** (col. 2 lines 37-43, "The partitioning is based on profile information about (data) ... access counts ... the most heavily referenced (data) ... are kept in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold (memory location)").

As per claim 9, the rejection of claim 2 is incorporated and further, Chilimbi discloses that the **data moving step comprises sampling a plurality of said associated counters on an intermittent basis to determine if the count therein has reached said threshold value** (col. 2 lines 37-43, "The partitioning is based on profile information about (data) ... access counts (which is sampled on an intermittent basis,



then) ... the most heavily (executed data) ... are (placed) in a hot (memory location) ... while the remaining (data) ... are placed in a ... cold (memory location)").

As per claim 10, the rejection of claim 1 is incorporated and further, Chilimbi discloses **determining if a number of hot data in said hot partition of said memory exceeds a second threshold value; and if said number of said hot data exceeds said second threshold value, then expanding the size of said hot partition in said memory by adding thereto an expansion area contiguous to said hot partition** (col. 2 lines 37-39, "The partitioning is based on profile information about (data) ... access counts", and Fig. 1, item 20, and the associated text (e.g. col. 4 line 5 – col. 5 line 67), describes a conventional computer system, which is capable of creating and maintaining numerous memory partitions).

As per claim 12, Chilimbi also discloses such claimed limitations as addressed in claim 2, above.

As per claims 13-20 and 22 this is a system version of the claimed method discussed above, in claims 1-6, 9 10 and 12, wherein all claimed limitations have also been addressed and/or cited as set forth above. For example, see Chilimbi's system to optimize cache utilization, (col. 2:35-56).



As per claim 23, this is a product version of the claimed method discussed above, in claim 1, wherein all claimed limitations have also been addressed and/or cited as set forth above. For example, see Chilimbi's system to optimize cache utilization, (col. 2:35-56).

4. Claims 11 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chilimbi et al. (Chilimbi), U.S. Patent No. 6,330,556, in view of Neufeld, U.S. Patent No. 5,974,438, further in view of Walls, U.S. Patent No. 5,675,790.

As per claim 11, the rejection of claim 10 is incorporated and further Chilimbi does not explicitly disclose **removing all cold translations from said expansion area and storing said removed translations in said cold partition.**

However, Walls, in an analogous environment, discloses **removing all less-desirable data entries from a dynamic memory area and storing said removed data in a separate location** (col. 8 lines 36-39, "If the segment (data) is smaller than the minimum size (less-desirable) then remove the segment from the (section of) dynamic memory ... (and) insert the segment into a separate (location)").

Therefore, it would have been obvious to a person of ordinary skill in the art, at the time the invention was made, to incorporate the teachings of Walls into the system of Chilimbi to enable **removing all cold translations from said expansion area and storing said removed translations in said cold partition.** The modification would have been obvious because one of ordinary skill in the art would want to maintain the



Art Unit: 2192

temporal access advantages by keeping the less-desirable data items together and separate from both the most and least desirable data items.

As per claim 21, the combination of Chilimbi and Walls also discloses such claimed limitations as addressed in claim 11, above.

### ***Response to Arguments***

5. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andre R. Fowlkes whose telephone number is (571) 272-3697. The examiner can normally be reached on Monday - Friday, 8:00am-4:30pm.

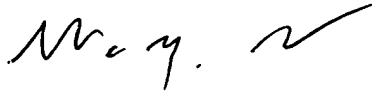
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571)272-3695. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



Art Unit: 2192

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ARF

  
**WEI Y. ZHEN**  
**PRIMARY EXAMINER**